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ABSTRACT

Its unique qualities makes asbestos extremely useful in industry, yet it is termed one of the most dangerous and insidious substances in the work place. Composed of mostly fibers, asbestos is readily freed into the atmosphere during handling, constituting a real health risk. There are two ways asbestos can enter the human body: by inhalation or ingestion. In addition to occupational activities, ways to come in contact with asbestos are: building homes near tailing piles; tracking asbestos in soil into homes and contaminating the living area; or unprotective piles of tailings rained on, eroding the pile and contaminating the region's drinking water. High asbestos concentrations can result from 40 mines and mills located on or near reservations, subjecting Indian people to airborne asbestos hazards. Preventative measures have been taken by the Bureau of Indian Affairs, Environmental Protection Agency and Indian Health Service to conduct a complete survey of building materials used in schools. Indian families may contact either the Indian Housing Authority of their Tribe or Housing and Urban Development's (HUD) regional office to find out if asbestos was used to build their homes. (ERB)

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AIO RED PAPER # 20

ASBESTOS

A Lingering Danger

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AUGUST 1980



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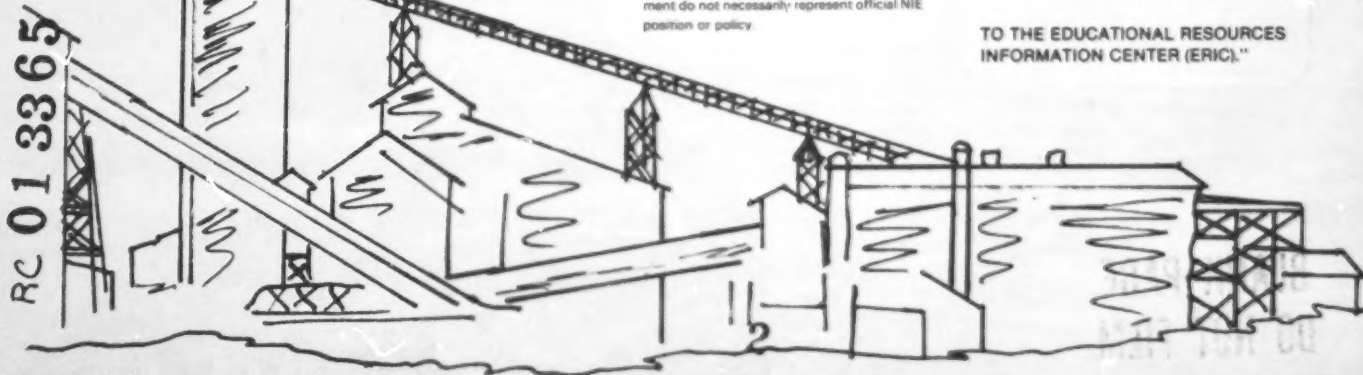
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ASBESTOS: A LINGERING DANGER

I. The Hazards of Asbestos

Asbestosis
Cancer
Mesothelioma

II. Uses of Asbestos

III. Exposure to Asbestos

IV. Indian Impacts

Appendix I: Asbestos, what you can do about it.

Appendix II: For More Information

Appendix III: Mines On Or Near Indian Lands.

Appendix IV: Natural Emissions

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ASBESTOS

Asbestos is a fibrous mineral which has over 3,000 recorded uses. Asbestos, a metamorphosed rock, is found in formations of limestone.¹ Usually it is accompanied by serpentine rock, or is incorporated as layers within layers of serpentine rock.² Its many unique qualities make it extremely useful in industry. The wide range of its uses include: applications in the automobile industry in brake linings and clutch facings, incorporation into many consumer products (e.g: hair dryers and paints), and utilization as a fire-proofing and insulating agent.³

That's it for the good news. The bad news is that it kills. Former Secretary of Health, Education, and Welfare, Joseph A. Califano, termed asbestos "one of the most dangerous and insidious substances in the work place."⁴ Asbestos is composed mostly of fibers. These fibers, which are readily freed into the atmosphere during handling, constitute the real health risk. Documentation shows exposure to asbestos in the work place increases worker deaths due to lung cancer to at least four times the national average.⁵ The gravity of the asbestos threat is illustrated by its impact on families of asbestos factory workers. There are thirty-seven known cases where family members died of asbestos-related diseases.⁶ The asbestos exposure of these people was limited to contact with dirty factory work clothes. Asbestos' hazards are thus very real. A further examination of its impacts is warranted.

The Hazards of Asbestos

After asbestos fibers become suspended in the air, there are two ways they can enter the human body: by inhalation or ingestion. When inhaled, they travel into the lungs where they become lodged in the lung tissue. Of all the asbestos fibers inhaled, only about one-half remain in the lungs; the rest are exhaled. Some of the fibers that enter through the mouth become entrapped by saliva. This saliva, which is swallowed, travels to the gastrointestinal tract.⁷ In this way, asbestos fibers can become lodged in the intestine wall. Most ingested fibers do, however, pass out with the body's fecal matter.⁸

For almost all asbestos-related diseases there is a long latency period. This means that the time from initial asbestos exposure to the appearance of the actual disease is a period of many years. For instance, most deaths due to asbestos-related diseases occur, on the average, 30 to 30 years after the initial exposure.⁹ The length of the exposure period can be correlated with the length of the latency

period. Disease will appear earlier in those with a higher level of exposure.¹⁰ Also, those with higher levels of exposure on either a time or volume basis, have a greater risk of contracting asbestos-related diseases.¹¹

Asbestosis

One disease which can result from asbestos contact is asbestosis. Asbestosis is defined as a terminal pneumoconiosis, a disease caused by the inhalation of mineral fibers.¹² It involves fibrotic changes in the lungs which reduce air capacity and restrict lung expansion capabilities.¹³ The asbestos fibers clog the lungs so that breathing becomes difficult. Because of these changes, those suffering from asbestosis often experience shortness of breath. Breathing is further restricted by a fluid build-up in the lung cavity, known as a pleural effusion.¹⁴ As mentioned before, asbestosis is a terminal condition.

Cancer

Asbestos exposure can also lead to a variety of cancers. These include "cancers of the esophagus, stomach, colon, and rectum."¹⁵ In the case of women asbestos workers, the chances of contracting ovary and cervix cancer are three times greater than for females in general.¹⁶ Lung cancer risks, as mentioned earlier, are greatly enhanced. Certain cancers of the digestive system occur twice as frequently in asbestos workers as in the general public.¹⁷

Mesothelioma

Finally, the most deadly asbestos-related cancer is Mesothelioma. Specifically, Mesothelioma is a cancer in the lining of either the abdominal, lung, or heart cavity. Eight to eleven percent of deaths among asbestos workers are due to Mesothelioma.¹⁸ For those who have had no exposure to asbestos, this disease is extremely rare.¹⁹ Usually, those who contract the disease are dead within six months to a year after its onset.

Uses of Asbestos

Asbestos has been used extensively in industry because of its many unique qualities. Asbestos can withstand heat in excess of 500 degrees centigrade. Because of its flexibility, it can be woven into fabrics and yet it "has a tensile strength equal to steel." It also absorbs sound very well, and "is resistant to the actions of acids and many other chemicals."²⁰

Each year the automobile industry uses 103 million pounds of asbestos for car brake linings and 4.5 million pounds for clutch facings.²¹ Asbestos is used here because of its heat-withstanding capabilities. As an insulation and fire-proofing material, asbestos was used extensively from 1958 to 1970, and beyond. Structures built or renovated during the period from the end of World War II to 1978 should be suspected of containing asbestos.²³ Applications of fiber were sprayed on ceilings, walls, and structural steel to protect buildings and houses from fire.²⁴ Sometimes, sprayed-on asbestos served more of a decorative function rather than as a fire preventative.²⁵ Vinyl and asphalt tiles and roofing materials also have asbestos as one of their components.²⁶

Outside the industrial realm, asbestos was used in a host of consumer goods. Many types of paint and caulk contained considerable amounts of asbestos. Although some asbestos-containing products were banned from the market by the U.S. Government, asbestos still persists in certain "texture paints."²⁷

The Consumer Product Safety Commission is currently involved with a study of a vast array of household appliances and other goods. They're trying to determine whether or not the asbestos content of these products constitutes any threat to consumers. Some of the items under examination are: "electric broilers, french fryers, frying pans, electric mixers, popcorn poppers, slow cookers, ranges, ovens, dishwashers, clothes washers and dryers, curling irons, electric blankets, and portable electric heaters."²⁸

Exposure to Asbestos

There are as many ways to be exposed to asbestos as there are products which contain it. Two major categories of asbestos exposure exist: occupational and non-occupational.

Of those who contacted asbestos in the work place, one of the groups most severely impacted were asbestos factory workers. The first stage of the factory process is the milling operation where crude asbestos fibers are refined, packaged, and shipped off. From here the fibers travel to factories which produce asbestos goods (such as asbestos pipe insulation, brake linings, etc.). An estimated 70,000 workers involved in these two processes face uncertain futures. All stand a chance of dying from asbestos-related diseases within the next four decades.²⁹

Over half the office buildings constructed from 1958 to 1970 contain asbestos fire-proofing materials.³⁰ The people who handled these materials inhaled high concentrations of

asbestos fibers. The removal of old insulation before installing new applications also creates large amounts of airborne fibers. Insulation workers are not the only ones who were impacted by these dust conditions. Carpenters, masons, and others working in the vicinity of insulators breathed in contaminated air as well.³¹

A similar thing occurred in the shipbuilding industry. In the confined space of a ship's hull, workers performing many different tasks were forced to breath asbestos-contaminated air.³² Asbestos entered the air when old pipe insulation containing asbestos was stripped from pipes. Many shipyard workers employed during the last several decades are now dying in large numbers.³³ This further demonstrates the deadly potential of asbestos.

Over two million automobile repair specialists come into contact with asbestos on a daily basis.³⁴ Brake linings and clutch facings, which contain about 50 percent asbestos by weight, release fibers during repairs.³⁵ One study shows that during a brake change, fiber concentrations can exceed levels permissible by the Occupational Safety and Health Administration regulations.³⁶ As these fibers spread through the general garage area they reach lower, safer concentrations. But still, even at these concentrations, other people working in the garage "are at risk."³⁷

The federal government released in 1978 a list of fifteen regions which are "prone to asbestos disease." Most of the cities named are located on water, an indication of the shipbuilding industry's strong connection with asbestos-related diseases. The cities named are as follows: the tidewater area of Virginia; Boston; Philadelphia; New York City; Charleston, S.C.; Jacksonville, Fla.; New Orleans; Houston; Detroit; San Diego; Los Angeles; San Francisco; Seattle-Tacoma, Wash.; and Hawaii.³⁸

Those having no occupational involvement with asbestos can come into contact with it in a number of other ways. Areas surrounding asbestos factories, mines, or mills can contain hazards for its residents. Evidence reveals that living in these areas greatly increases one's chances of contracting Mesothelioma.³⁹ Asbestos fibers which enter the air from these sources cause the health problems. At the Coalinga mine site in California, a considerable waste fiber problem was noted in 1974. At a distance of 500 meters downwind from one of the tailings piles, concentrations of fibers were 100 million fibers per cubic meter.⁴⁰ In 1972, readings 100 meters downwind from a mill near King City, California, recorded 100 million fibers per cubic meter.⁴¹ Readings three kilometers from the same mill produced 1 million fibers per cubic meter.⁴²

In Finland, a study of the environmental effects of a mine/mill complex revealed asbestos particles in the air 27 kilometers away.⁴³ Clearly, with this kind of range, an asbestos operation does present a health threat to its neighboring community. And finally, transportation of crude asbestos from mine to mill can also result in environmental contamination.⁴⁴

Communities can become contaminated through the demolition of buildings containing asbestos insulation. Since 1973, federal regulations have prohibited this practice.⁴⁵ Federal regulations also stipulated that no factory, mill, or asbestos spray operation (i.e: fire-proofing inside buildings) could produce "visible" outside (meaning "air outside buildings and structures") emissions.⁴⁶

Tailings piles, the debris produced during milling, could become a major problem as more and more of them are rediscovered. A group of 120 residents in Globe, Arizona, made just such a discovery. After living in their housing subdivision for six years, on land previously owned by Metate Asbestos Corporation, they found out they were living on a huge pile of asbestos tailings. In 1973, before the land was sold, Metate used asbestos tailings as landfill on the subdivision. In 1979, an investigation of a malfunctioning sewer line produced the tailings discovery.⁴⁷ Investigators reported asbestos concentrations as high as 60 percent in some of the soil samples taken.⁴⁸

Those living or working in buildings containing asbestos insulation or fire-proofing may be inhaling fibers all day long. The real hazard in this situation is posed by friable asbestos--a material which is crushable by hand. If friable materials are disturbed, they will release fibers. The same thing occurs as old, friable insulation starts to disintegrate due to old age, it frees fibers into the air.⁴⁹ Once released, fibers remain in the building. Gradually, they will settle out, but constant or even intermittent human activity causes them to be resuspended and recirculated.⁵⁰ A major concern for administrators is the prevalence of asbestos in children's schools. Steady exposure to this mineral at such a young age could greatly shorten the life spans for a number of these children. It is for this reason that the Environmental Protection Agency developed its school asbestos program (for a more detailed discussion, see Appendix I).

As mentioned earlier, consumers may face an asbestos exposure risk from many products currently on the market. An in-depth products study is now being prepared by the Consumer Product Safety Commission.⁵¹ The hazards of items such as brake linings and some paints are well known. Thus people

who enjoy doing repairs on their own homes or cars can be exposed to fibers just as readily as those who make a living off this kind of work.

Asbestos makes its way into our water supply, as well. In the case of Duluth, Minnesota, in 1977, its water was contaminated with asbestos because of human action. Fifty-five miles south of Duluth, on Lake Superior, is the Reserve Mining Company's taconite operation. Each day Reserve dumped many tons of taconite tailings containing asbestos contaminants into the lake.⁵² From 1955 to 1978, this was their procedure for disposing of waste tailings.

Many areas in the country naturally show higher counts of asbestos in their water. In particular, the Philadelphia and Atlanta areas are this way. Geologic formations in these areas are typical of asbestos-bearing rock, which explains the high water concentrations of the mineral.⁵³ Finally, about 200,000 miles of asbestos cement pipes are used to carry water to United States consumers.⁵⁴ This may account for higher than normal levels of asbestos in some city water.

Indian Impacts

High asbestos concentrations can result from mines or mills. Sometimes these operations occur on or near reservations, subjecting Indian people to airborne asbestos hazards. Of course, those who work in mines or mills are at greatest risk. From the San Carlos Apache Reservation as many as 57 people may have worked in the mines in neighboring Gila County. No health information is yet available, but these workers are in danger of contracting asbestos-related diseases.

Presently, there are only nine asbestos mines operating in the United States.⁵⁵ Three are located in Gila County, Arizona, near the San Carlos and White Mountain Apache Reservations. These are the only active mines which pose a threat to Indians. Inactive mines are another matter. Alaska, Arizona, California and Oregon contain mines on or near Indian reservations (for the complete list, See Appendix 3). The major threat from these mines are their tailings stacked in piles around the site. Tailings are the refuse rock and fiber from the mining and milling operations. An unstabilized pile (one that has not been covered with a protective barrier of soil and foliage) could free fibers into the air. Rain runoff, which erodes the piles, could become contaminated and end up in a region's drinking water.

People also build their homes on or near tailings piles ignorant of the hazards present. Asbestos in soil is tracked into homes, contaminating the living area. Air and soilborne

asbestos gets on to clothing, skin and food, and is breathed into the lungs. This is precisely what happened to the residents in Globe, Arizona. They set up their homes totally unaware that they were living on an asbestos timebomb. For some Indian tribes an incident like this is very possible. In total, forty asbestos mines, new and old, occur on or near Indian lands. Soils bearing asbestos are common at these sites.

High natural emissions of asbestos are prevalent in certain sections of the nation. Again, Indian lands are involved. In these areas, asbestos-type rocks are exposed to nature's wear and tear. Fibers, flushed out by wind and water erosion, end up in drinking water in concentrations higher than normally experienced. Appendix 4 contains two lists: one which lists natural emission areas and one which lists the tribes in those areas. Also included is one map of asbestos-bearing regions.

Asbestos can also end up in drinking water through the deterioration of asbestos cement (A/C) pipe. Water, coursing through the pipe, breaks down its walls leading to asbestos contamination. The degree of asbestos released into the water is linked to a number of factors, such as: "length of pipe traversed" and "velocity of flow."⁵⁶ Over 200,000 miles of A/C pipe carry water in the United States and, of course, some of it is on Indian reservations. This pipe, installed by the Indian Health Service, brings water to many Indian peoples (to find out if A/C pipe has been used in a particular reservation project, contact your IHS area office, See Appendix 5).

The verdict on waterborne asbestos is not yet in. Doctors are not sure whether ingested asbestos fibers pose a health hazard.⁵⁷ Airborne fibers, in the past, received most of the attention of researchers, and only recently has the investigation turned to waterborne fibers. It may be that in three years scientists will discover ingested fibers do not cause cancer. Presently, no one can say for sure. We do know that those people occupationally exposed to asbestos have developed gastrointestinal cancers.⁵⁸ Still, whether it was inhaled or ingested, fibers which caused the carcinoma are not known. We'll all just have to sit tight and hope that those 200,000 miles of pipe do not pose a hazard to our health....

Another area of concern, in a seemingly never-ending list, is HUD housing, which may contain asbestos in materials. Asbestos fibers freed from this insulation can seriously impact on Indian health. There is one way to find out if asbestos is in houses, that is to contact the architect who designed them. HUD does not have its own architects, rather it or the local Indian Housing Authority contracts out for the services of an architect. Each architect, following guidelines specified by HUD, calls for certain materials to be used in his or her structures. Not all the architects employed asbestos. To

locate the architect, one should contact either the Indian Housing Authority of their Tribe or HUD's regional office of Indian Programs (See Appendix 5 for HUD's regional offices).

And finally, the BIA deserves some mention. The BIA reacted favorably during the recent flurry of newspaper and magazine articles on asbestos in public schools. At a joint meeting with EPA and IHS in 1979, BIA offered to act as a clearinghouse for a BIA school asbestos survey. Through its Division of Safety Management, BIA orchestrated plans for a complete survey of their schools. Each area office was delegated responsibility for surveying its own schools. Analysis of material samples removed from these schools takes place at the Division of Safety Management's offices in Albuquerque, New Mexico. If actions to correct an asbestos problem are necessary, it is the responsibility of the BIA area offices and the administrators of the individuals schools to carry them out.

Unfortunately, according to David Moore of the Division of Safety Management, the survey is taking more time than it should to complete. At the writing of this paper only a little more than half the schools had responded. Investigators discovered asbestos in only a few of these cases.

Parents of children who attend BIA schools can find out if their school has been checked for asbestos by contacting the BIA area safety manager (a list of BIA area offices is included in Appendix 5).

APPENDIX I: Asbestos, what you can do about it.

The Environmental Protection Agency is concerned about asbestos and its use in schools. To cope with the problem EPA developed its school asbestos program. Its thrust is to educate school administrators, informing them of actions needed to discover and control an asbestos problem. The foundation of this program is the EPA asbestos guidebook (Asbestos-Containing Materials in School Buildings: A Guidance Document, 1979). Although the guidebook is intended for use in schools, it would serve as an excellent guideline for anyone with an asbestos problem. In the guidebook procedures for controlling asbestos hazards are given, which are: inspection, sampling, analysis, exposure assessment and corrective action.

Asbestos has many uses in buildings. The most likely source of asbestos contamination is friable, asbestos-bearing materials. Friable materials are those crushable by hand. These materials have a fluffy, irregular textured or spongy appearance. Different locations where asbestos is found include: steel support beams, columns, ceilings, walls, corridors, auditoriums, cafeterias, machinery rooms, storage rooms and the overhead areas of gymnasiums and indoor pools.

In the inspection phase of the school program, administrators should tour the entire building, checking all likely asbestos-use areas. During the second phase of the program, all materials which appear friable should be sampled. Proper equipment and techniques for sampling materials are described in the EPA guidebook. After all samples have been collected and recorded they go to a laboratory for analysis.

The EPA guidebook recommends specific analytic techniques for these samples. Certain techniques are strongly discouraged. This is one important reason for reading the EPA guidebook thoroughly. No one, under any circumstances, should attempt an asbestos study of their building or school before reading the guidebook. Asbestos should not be treated lightly; it is one of the most potent carcinogens known to humankind. The information and recommendations contained in the guidebook will protect those performing studies and ensure accurate results.

After the laboratory stage, administrators must do an "exposure assessment", which means "an assessment of the potential for people to be exposed to asbestos." Again, the guidebook explains this process completely and includes recommendations for corrective actions necessary in specific situations.

Sometimes an asbestos threat is so great that asbestos materials must be removed from the building. In other situations enclosure or encapsulation techniques will suffice.

Encapsulation involves spraying asbestos with a sealant. This technique, although inexpensive, has very limited applications. For instance, its use on badly damaged (e.g: torn or water damaged) materials will not adequately prevent asbestos contamination. In this kind of situation enclosure may be more appropriate. Building a protective wall or ceiling, enclosing the potential asbestos source, would prevent contamination of building air. Instructions for all control techniques are well-outlined in the EPA guidebook.

The EPA guidebook is really two separate booklets. The first booklet is directed to school administrative officials. It explains the school asbestos program and the courses of action necessary. The second booklet, intended for those actually working to clean up asbestos contaminants, is much more technical than the first. It contains indepth explanations of the procedures for handling asbestos.

(Information for this appendix was taken directly from the EPA guidebook).

APPENDIX II: For more information...

There are a number of ways to move into action. EPA has set up a couple of toll-free numbers where people can receive information.

*To receive copies of the school asbestos guidebook dial: 800/424-9065.

*For technical assistance on sampling and analysis of asbestos materials dial: 800/334-8571 (Ext. 6741) and ask for Mr. Brantley.

You can obtain information and assistance from the EPA regional Asbestos Coordinators. These coordinators will provide technical assistance to local officials and interested individuals. Each regional office also offers training sessions to instruct those working with asbestos problems. Along with this, EPA has produced a videotape on asbestos control procedures which is available to the public.

The addresses and telephone numbers of EPA's regional Asbestos Coordinators are as follows:

Region 1:

Mr. Paul Heffernan
Asbestos Coordinator
Air & Hazardous Materials
Division
Pest & Toxic Substances Branch
EPA Region I
JFK Federal Building
Boston, Massachusetts 02203
Phone: (617) 223-0585

Region 2:

Mr. Marcus Kantz
Asbestos Coordinator
EPA Region II
Room 802
26 Federal Plaza
New York, NY 10007
Phone: (212) 264-9538

Region 3:

Ms. Pauline Levine
Asbestos Coordinator
EPA Region III
Curtis Building
6th and Walnut Streets
Philadelphia, PA 19106
Phone: (215) 597-8683

Region 4:

Mr. Dwight Brown
Asbestos Coordinator
EPA Region IV
345 Courtland Street
Atlanta, GA 30308
Phone: (404) 881-3864

Region 5:

Mr. Tony Restaino
Asbestos Coordinator
EPA Region V
230 South Dearborn Street
Chicago, IL 60604
Phone: (314) 353-2291

Region 6:

Dr. Norman Dyer
Asbestos Coordinator
EPA Region VI
First International Building
1201 Elm Street
Dallas, Texas 75270
Phone: (214) 767-2734

Region 7:

Dr. Wolfgang Brandner
Asbestos Coordinator
EPA Region VII
324 East 11th Street
Room 1500
Kansas City, Missouri 64106
Phone: (816) 734-3936

Region 8:

Mr. Steve Farrow
Asbestos Coordinator
EPA Region VIII
1860 Lincoln Street
Denver, CO 80295
Phone: (303) 837-3926

Region 9:

Mr. Kirby Narcisse
Asbestos Coordinator
EPA Region IX
215 Fremont Street
San Francisco, CA 94105
Phone: (415) 556-4606

Region 10:

Ms. Margo Partridge
Asbestos Coordinator
EPA Region X
1200 Sixth Avenue
Seattle, WA 98101
Phone: (206) 442-5560

For more information on asbestos in consumer products,
contact the Consumer Product Safety Commission at the following
numbers:

- (800) 638-8326 in the continental United States.
- (800) 638-8333 in Alaska, Puerto Rico, Virgin Islands,
and Hawaii.
- (800) 492-8363 in Maryland.

APPENDIX III: Mines On or Near Indian Lands

Alaska

- Admiralty Island at Chitina on Copper River (1932)
- Northwest Alaska, Shungnak on Kobuk River (1932)
- Dahl Creek area of Kobuk River (1944)
- Lemesurier Island, Southwest Alaska (1944)
- Ibex Mountain, Hyden Alaska (1955)

Arizona

- Twenty-six mines in Gila County, many of which are on San Carlos and White Mountain Apache Reservations, (see map #1).
- Three mines in Gila County owned by Asbestos Mining Company, Jaquays Mining Corporation, and Metate Asbestos Corporation respectively (1980).

California

- Inyo County, Lone Pine (1941)
- Tuolumne County, Jamestown (1952)
- Riverside County, Santa Rosa (1954)
- Fresno County, owned by Atlas Minerals Corp. (1980)
- Fresno County, owned by Coalinga Asbestos Corp. (1980)

Oregon

- Grant County, owned by Coast Asbestos Company (1961)

(Information for this Appendix was taken from Minerals Yearbook put out by the Department of the Interior. Yearbooks from 1932 to 1978 were used.)

ASBESTOS DEPOSITS OF ARIZONA

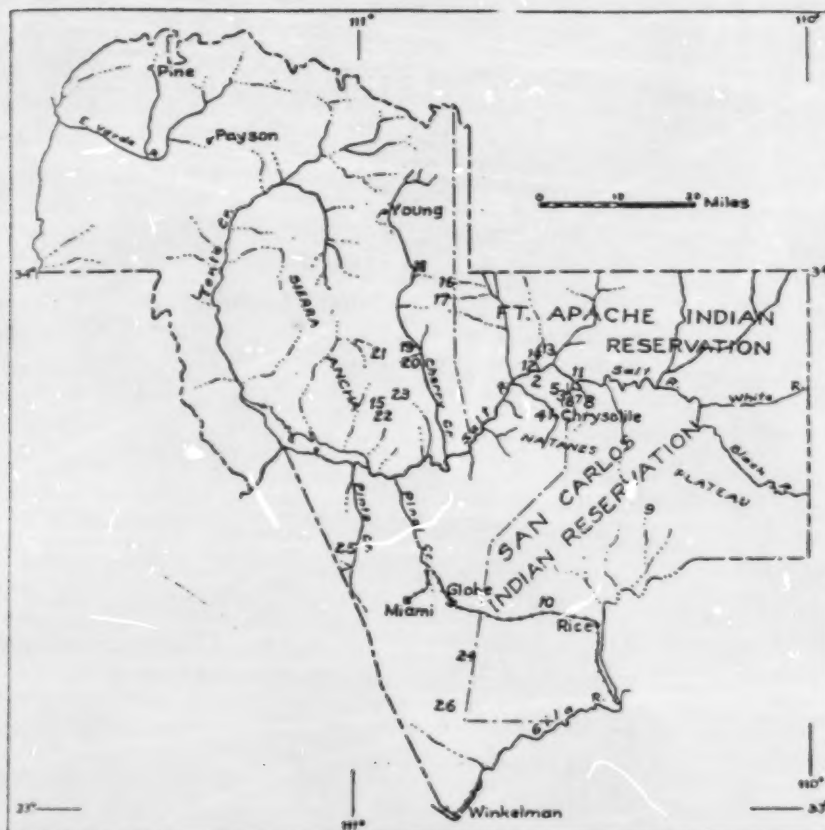


Fig. 2.—Index map showing distribution of Gila County asbestos properties considered in this report.

- | | |
|-----------------------------------|--------------------------------------|
| 1. Ariz. Asbestos Association. | 14. Seven Star. |
| 2. Regal. | 15. American Ores, or International. |
| 3. Seventy-two and Monte Christo. | 16. Aileen. |
| 4. Globe Asbestos Co. | 17. Rock House. |
| 5. Crosthwaite-Steward. | 18. Triangle. |
| 6. Accident (Seneca). | 19. Sloane. |
| 7. Falls. | 20. Pueblo. |
| 8. Cobb & Dunaway. | 21. Reynolds Falls. |
| 9. Lunn & Mathews. | 22. Friday. |
| 10. Apache. | 23. Knighton. |
| 11. Horse Shoe. | 24. Southeastern Pinal Mts. |
| 12. Riverside. | 25. Pinto Creek. |
| 13. Lorie & Lena. | 26. Mescal Mts. |

MAP #1

(Asbestos Deposits of Arizona, page 27, see biblio.)

Appendix 4: Natural Emissions

areas of natural emissions-

- Alaska - panhandle
 - Central areas
- Arizona
- California - most of the state
- Idaho - northern
- Iowa - (see map #2)
- Kansas - (see map #2)
- Minnesota (see map #2)
- Montana - southwest
- Nebraska - southwest
- New Mexico - northern and western
- New York - northern
- North Carolina - western
- Oregon - southern
 - eastern
- Utah - west
 - central
- Washington - northern
- Wisconsin - north central
- Wyoming - central to north western

tribes impacted by natural emissions:

- Alaska - Athapascans
 - Eskimos
 - Tlingit
- Arizona - Navajo
 - Papago
 - San Carlos Apaches
 - White Mountain Apaches
- California - Chemehuevi
 - Colorado River Reservation
 - Hoopa Valley
 - Lone Pine Paiute and Shoshone
 - Round Valley reservation
 - Tule River
 - most of the tribes in Southern California
- Idaho - Coeur D' Alene
 - Nez Perce

Kansas

- Kickapoo
- Potawatomi
- Iowa Sac and Fox

Minnesota

- Fond du Lac Chippewa
- Mille Lac Chippewa

Montana

- Flathead

New Mexico

- Ute Mountain Reservation
- Jicarilla Indian Reservation
- Cochiti Pueblo
- Jemez Pueblo
- Zia Pueblo
- Santo Domingo Pueblo
- Santa Ana Pueblo
- San Felipe Pueblo

New York

- St. Regis Mohawks

Nevada

- South Fork Shoshone
- Walker River Paiute
- Washoe Indian Reservation
- Winnemucca Paiute and Shoshone
- Elko Shoshone

North Carolina

- Eastern Cherokee

Oregon

- Burns-Paiute
- Fort McDermitt Indian Reservation

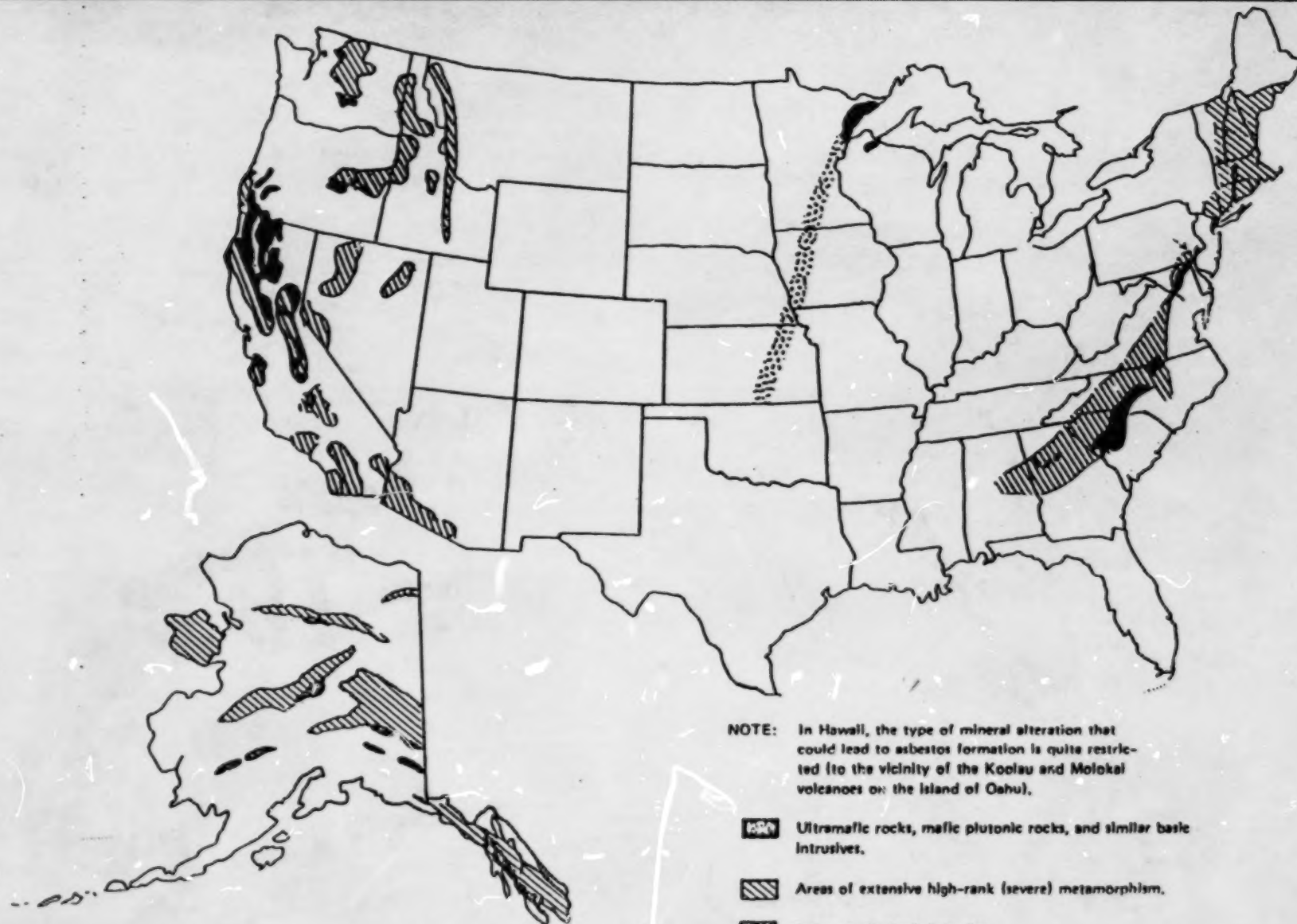
Washington

- Colville
- Tulalip Snohomish

Wisconsin

- Bad River Chippewa
- St. Croix Chippewa

(This information was taken from the two maps contained in this appendix).



NOTE: In Hawaii, the type of mineral alteration that could lead to asbestos formation is quite restricted (to the vicinity of the Koolau and Molokai volcanoes on the island of Oahu).

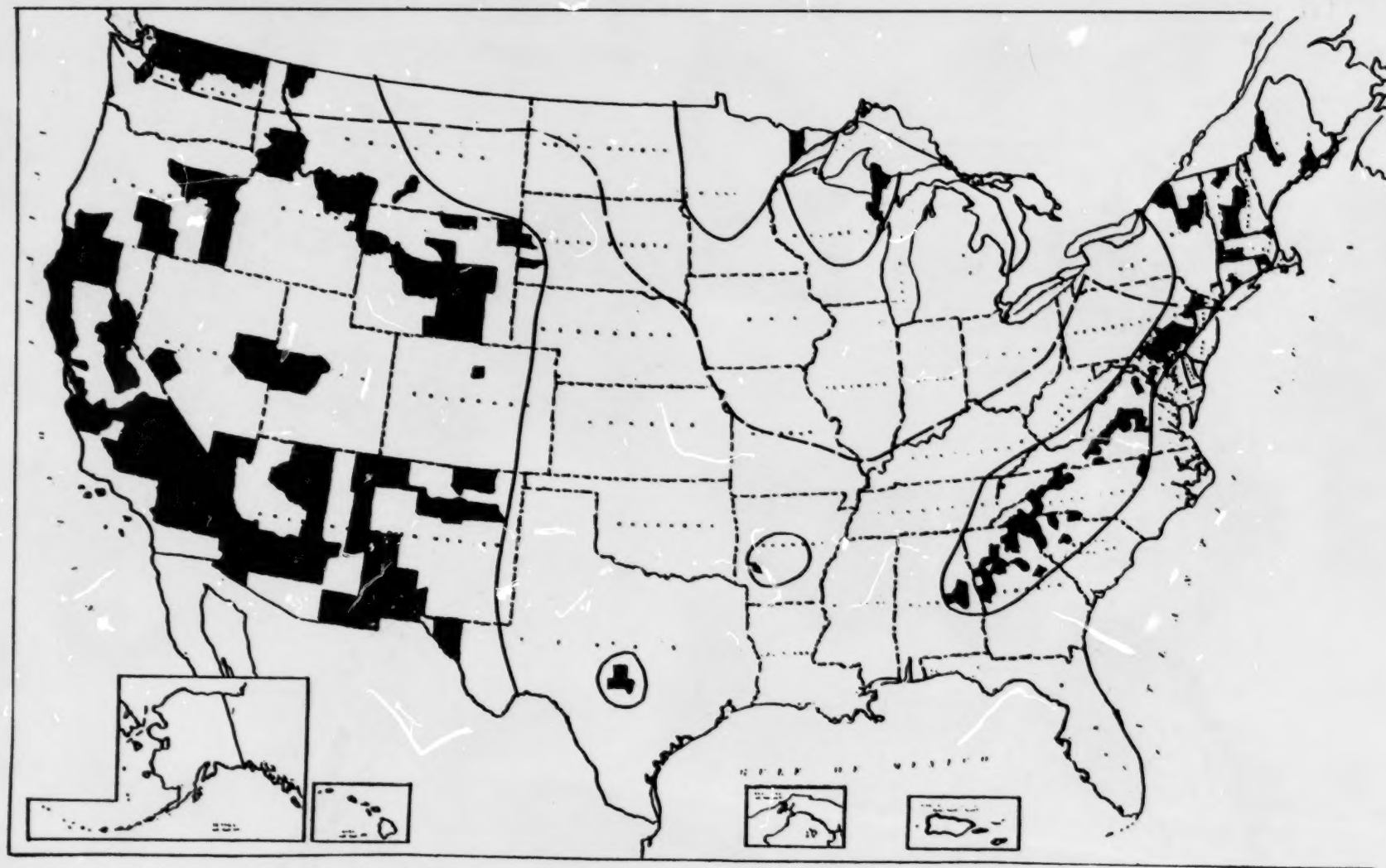
-  Ultramafic rocks, mafic plutonic rocks, and similar basic intrusives.
-  Areas of extensive high-rank (severe) metamorphism.
-  Inferred ultrabasic intrusives.

SOURCES: "Tectonic Map of North America," U.S. Geological Survey; SRI International

MAP #2

(Regions where asbestos is likely to be found.)

Levine, page 4.



MAP #3

Black areas represent counties which report formations of asbestos.
(American Water Works Association article, p. 12)

APPENDIX 5: Other Feds and Bureaucrats.

HUD Regional Offices of Indian Programs

Ignacio Galindo
1375 Sutter Streets
San Francisco, California 94109
Phone: (415) 556-9190

Vernon Haragara
P.O. Box 1128
Albuquerque, NM 87103
Phone: (505) 766-3926

George Bennett
300 S. Wacker Drive
Chicago, IL 60606
Phone: (312) 837-2963

Indian Health Service Program and Area Offices

Aberdeen Program Office
Indian Health Service
Federal Building
115 4th Street, S.E.
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Billings Area Office
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Navajo Program Office
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Window Rock, Arizona 86515
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Oklahoma Area Office
Indian Health Service
388 Old Post Office and Court-
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801 East Indian School Rd.
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ORD-Tucson Program Office
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Federal Building
Anadarko, Oklahoma 73005

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FOOTNOTES

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